

## Auxiliar 6

Polímeros y procesos en polímeros

P1

$$D = 40 \text{ mm}$$

$$D_i = 5 \text{ mm}$$

$$N = 0.5 \text{ rev/s}$$

$$L_i = 50 \text{ mm}$$

$$d_{\text{can}} = 3 \text{ mm}$$

$$F = 20 \text{ kN}$$

$$\theta = 20^\circ$$

$$\eta = 60 \text{ Pa}\cdot\text{s}$$

Tornillos:

$Q = Q_{\text{max}}$  no contrapresión en el molde

$$Q_{\text{max}} = \frac{1}{2} \pi^2 N D^2 d_{\text{can}} \sin \theta \cos \theta$$

$$= 3806,79 \text{ mm}^3/\text{s}$$

$$= 3,806 \text{ cm}^3/\text{s}$$

$$t_m = \frac{Vol_{\text{total}}}{Q_{\text{max}}} = \frac{70 \cdot 1.05}{3,806} = 19.31 \text{ s}$$

(Heads to  
mold)

Tiempo de inyección

$$Q_i = kP$$

$$P = \frac{F}{\frac{\pi D_i^2}{4}} = \frac{20000}{\frac{\pi (40)^2}{4}} = 15.916 \text{ MPa}$$

$$k = \frac{\pi D_i^4}{128 \eta \cdot L_i} = \frac{\pi \cdot 5^4}{128 \cdot 60 \cdot 50} = 0.00511 \frac{\text{mm}^3}{\text{Pa} \cdot \text{s}}$$

$$\Rightarrow Q_i = \cancel{15.916 \cdot 10^6 \text{ Pa} \cdot 0.00511 \frac{\text{mm}^3}{\text{Pa} \cdot \text{s}}} =$$

$$= 15.916 \cdot 10^6 \text{ Pa} \cdot 0.00511 \frac{\text{mm}^3}{\text{Pa} \cdot \text{s}} =$$

$$= 81,380,76 \frac{\text{mm}^3}{\text{s}}$$

$$Q_i = 81,380 \frac{\text{mm}^3}{\text{s}}$$

$\Rightarrow$  tiempo de inyección

$$t_i = \frac{Vol}{Q_i} = \frac{70 \cdot 10^3}{81.38} = 0.903 \text{ seg}$$

5) TMP

19,31 20

$$t = t_{\text{on}} + \max(t_{\text{fault}}, t_{\text{noth}})$$

$$= 0,903 + 20 \approx 21 \text{ sy}$$

$$\Rightarrow 171 \text{ pieces/hour}$$

$P_2$

Extension ~~Exercises~~

Datos

Tambor	Tornillo	Plástico	Metro
$H = 1.5 \text{ m}$	$D_o = 50 \text{ mm}$	$\eta = 70 \text{ Pa}\cdot\text{s}$	$D_o = 120 \text{ mm}$
$D_m = 0.5 \text{ m}$	$N_t = 0.5 \text{ rev/s}$	$r_s = 1.4$	$L_o = 60 \text{ mm}$
$t_m = 2 \text{ mm}$	$d_c = 10 \text{ mm}$	$\sigma_y = 12 \text{ MPa}$	$t_s = 40 \text{ s}$
	$L = 1500 \text{ mm}$		+ 15% extra volumen
	$\theta = 20^\circ$		

$$\textcircled{a} \quad \sigma = \frac{P \cdot D}{2 t} \Rightarrow P_{\min} = \frac{\sigma \cdot 2 \cdot t}{D} = \frac{12 \text{ MPa} \cdot 2 \cdot 2 \text{ mm}}{0.5 \text{ m}} \cdot 0.002$$

$$P_{\min} = 96 \text{ kPa}$$

$$\textcircled{b} \quad P_{\text{reson}} \neq P_{\min}$$

$$t_T = t_s + t_e \quad ; \quad t_T = t_e + 40 \text{ s}$$

$$Q_x = \underbrace{0.5 \pi^2 D_e^2 \cdot d_c \cdot \sin(\theta) \cdot \cos(\theta)}_A - \underbrace{p \pi \cdot D_e \cdot \sin^2(\theta)}_B \cdot 12 \eta L$$

$$Q_x = K_x P = \frac{\pi \cdot D_o \cdot t_o^3}{2 \eta \cdot L} \cdot P \} C$$

No tenemos  $q$  y podemos factorizar por  $P$ , porque  
el término  $A$  no lo tiene,

Por

$$\Rightarrow A - B = C \Rightarrow A = B + C \Rightarrow A = C \left(1 + \frac{B}{C}\right)$$

$$\Rightarrow C = \frac{A}{\left(1 + \frac{B}{C}\right)} = Q_x$$

Así podemos obtener  $Q_x$  sin saber  $P$

Desarrollando:

$$A = 0.5 \cdot \pi^2 \cdot 15 \text{ cm}^2 \cdot 1 \cdot \sin(20) \cdot \cos(20) = 178.4 \text{ cm}^3/\text{s}$$

$$\frac{B}{C} = \frac{\cancel{\pi} \cdot 15 \cdot 1^3 \cdot \sin 20^\circ \cdot \cancel{P}}{12 \cancel{P} \cdot 150} ; \text{ falta } t_p$$

$$\frac{\cancel{\pi} \cdot 12 \cdot \cancel{(t_p^3)} \cdot \cancel{P}}{2 \cancel{P} \cdot 6}$$

$$\textcircled{1} D_p = r_s \cdot D_b \quad , \quad \text{De } \textcircled{1} D_p = 168 \text{ mm}$$

$$\textcircled{2} t_p = r_s^2 \cdot t_b \quad \Rightarrow \quad \text{De } \textcircled{2} t_p = 5.95 \text{ mm}$$

$$\textcircled{3} D_H \cdot t_H = D_p \cdot t_p \quad \text{De } \textcircled{2} t_b = 3 \text{ mm}$$



Reemplazando  $\frac{B}{C} = 0.035 \rightarrow C = Q_x = 172.3 \frac{\text{cm}^3}{\text{s}}$

- Como hay que extrusor en 15 % extra.

$$L_f = 1.15 \cdot 1.5 = 172.5 \text{ cm}$$

- Flujo se coloca en la boquilla, no en el pistón  
(Antes de la extrusión)

$$V_{ol} = \frac{\pi}{4} \cdot (r_1^2 - r_2^2) \cdot L_f = 11.02 \text{ cm}^2 \cdot L_f$$

$$12^2 - 11.4^2$$

$$= 1902 \text{ cm}^3$$

$$t_c = \frac{V_{ol}}{Q_x} = 10.6 \text{ s} \rightarrow t_r = 50.4 \text{ seg}$$

	Nombre completo
→ 51 s	
~ 70	tanbom
	hore
	Fecha
	Firma